DINÁMICA I
LEYES DE NEWTON

4) $m = 2300\ t$
$F_m = 3 \cdot 10^7\ N$

$P = 2300 \cdot 1000 \cdot 9'81 = 2'3 \cdot 10^6 \cdot 9'81 =$
$= 22'56 \cdot 10^6\ ;$

b) $F_T = F_m - P$

$F_m = 30 \cdot 10^6 - 22'56 \cdot 10^6 = 7'437 \cdot 10^6\ N$

c) $\vec{F} = m \cdot a = 2'3 \cdot 10^6\ a\ ;$

$7'437 \cdot 10^6 = 2'3 \cdot 10^6 \cdot a\ ;$

$a = 3'2\ m/s^2$

(3) $150\ N$ durante $0'1\ s$
bola: $450\ g$

$\vec{F} = \frac{m \cdot \Delta\vec{v}}{\Delta t}\ ;\quad \Delta\vec{v} = \frac{F \cdot \Delta t}{m} = \frac{150 \cdot 0'1}{0'4} =$

$= 37'5\ m/s$

(7) $120\ km/h = 33'33\ m/s$
$15\ milésimas\ s = 0'015\ s$
$0'058\ kg$

$\vec{F} = \frac{m \cdot \Delta\vec{v}}{\Delta t}\ ;\quad \vec{F} = \frac{0'058 \cdot 33'33}{0'015} = 128'88\ N$

b) $\vec{a}_m = \frac{\vec{v}}{\Delta t} = \frac{33'33}{0'015} = 2222'22\ m/s^2$

EJEMPLOS RESUELTOS

10 - 17

(10) 1200 kg a 108 km/h (30 m/s)
6 s en pararse.

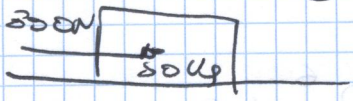
F pared:

$$\vec{F} = \frac{m \cdot \Delta\vec{v}}{\Delta t} = \frac{1200 \cdot (0 - 30)}{6} =$$

$$= -6000 \text{ N} //$$

(11) 300 N 50 kg

$\vec{v}$ (2 s)



$$F = \frac{m \cdot \Delta\vec{v}}{t} \; ; \; 300 = \frac{50 \cdot \Delta\vec{v}}{2} \; ;$$

$$\Delta\vec{v} = 12 \text{ m/s} //$$

(12)

100 s

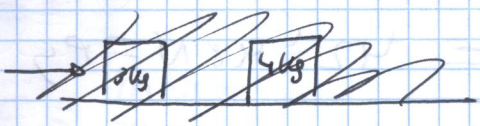
$$\vec{p} = m \cdot \vec{v}$$

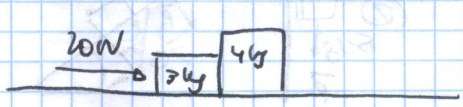
$(p_{total})_{inicial} = (p_{TOTAL})_{FINAL}$;

$$0'1 \cdot \vec{v}_1 = 5'01 \cdot 5 \; ;$$

$$\vec{v}_1 = 285 \text{ m/s} //$$

(13)





aceleración del conjunto.

$$a = \frac{\Delta \vec{v}}{\Delta t}$$

$$\vec{F} = m \cdot a = m \cdot \frac{\vec{v}}{t}$$

$$\vec{F} = \frac{m \cdot \vec{v}}{t}$$

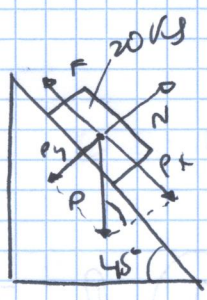
aceleración del conjunto:

$$\vec{F} = m\,(m_1 + m_2) \cdot a;$$

$$20 = 7 \cdot a; \quad a = 2'86\ m/s^2$$

Esta misma aceleración de A a B que de B a A.

(14)



$P = 20kg \cdot 9'81 = 196'2$

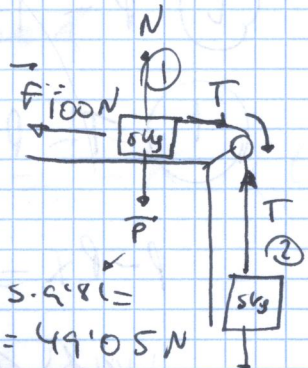
$P_x = \text{sen}\,45 \cdot 20 = 138'73$

$P_y = \cos 45 \cdot 20 = 14'14_N \cdot 9'81 =$

$= 138'73$

$F = 138'73$ //

(15)



$\vec{F} = m \cdot a;$

① $100 - T = 5 \cdot a;$

② $49'05 - T = 5 \cdot a$

$100 + T = 5a$

$49'05 - T = 5a$

$= 0$

$74'52 - 49'05 = 5 \cdot a;$

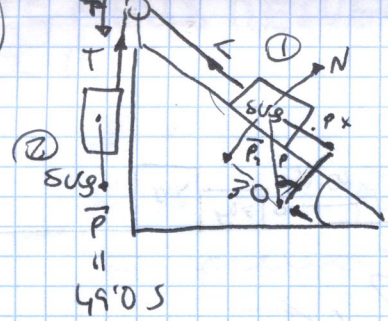
$a = 5'095\ m/s^2$

$T - P = ma$

$F - T = ma$

$\frac{T-P}{F-T} = 1;$ $\quad \frac{T - 49'05}{100 - T} = 1;$

(16)



$P_x = \text{sen } 30 \cdot 49'05 = 24'525\ N$

$P_y = \cos 30 \cdot 49'05 = 42'48\ N$

$N = 42'48\ N = P_y$

aceleración?

① $P_x - T = m \cdot a$

② $P - T = m \cdot a$

$-P_x + T = -m \cdot a$

$P - T = m \cdot a$

$-P_x + T = -1;$

$P - T$

$P_x - T = m \cdot a$

$T - P = m \cdot a$

$-T + P_x = m \cdot a$

$T - P = m \cdot a$

$24'525 - 49'05 = 10a$

$a = -2'45$

② $P - T = m \cdot a$

①

$P_x - T = m \cdot a$

$P - T = m \cdot a$

$P_x + T = P - T$

$-P_x + T = -m \cdot a$

$P - T = m \cdot a$

$-24'525 + 49'05 = 2m \cdot a$

① $P - T = m \cdot a$

① $T - P_x = m \cdot a$

$P - P_x = 2m \cdot a$

$mg - mg \text{ sen}\alpha = 2ma$

$mg(1 - \text{sen}\alpha) = 2ma$

$a = \dfrac{(1 - \text{sen}\alpha)g}{2}$

$\Sigma \vec{F} = m \cdot a$; $p = m \cdot \Delta \vec{v}$

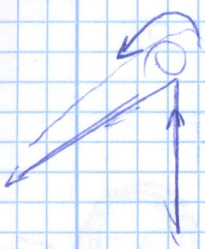
$\vec{F} = \frac{m \cdot \Delta \vec{v}}{\Delta t}$; p'

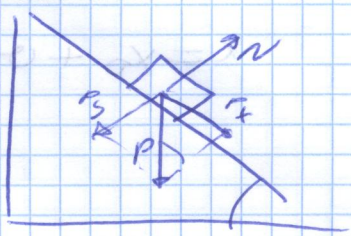
$\vec{F} = \frac{\vec{p}}{\Delta t}$; $m \cdot \vec{v} = \vec{F} \cdot \Delta t$

$\vec{I} = m \cdot \vec{v}$

Froz se opone al movimiento

$Froz = N \cdot \mu$





~~$P_x = P \cdot \cos\alpha$~~

~~$P_y = P \cdot \sin\alpha$~~

$P_x = P \cdot \sin\alpha$

$P_y = P \cdot \cos\alpha$

gravitación universal

$F_g = G \cdot \frac{m_1 \cdot m_2}{d^2}$ $\quad G = 6'67 \cdot 10^{-11}$

$\vec{F} = K \cdot \frac{Q \cdot q_2}{d^2} \cdot \vec{u}$

duda: cómo se calcula todas las fuerzas en un plano inclinado

Hooke

$F = -K \cdot (l - l_0)$

x

$\Sigma \vec{F} = m \cdot a$;

$\Sigma \vec{F} = \frac{m \cdot \Delta \vec{v}}{\Delta t}$;

$\vec{\Sigma} = \frac{\vec{F}}{\Delta t}$;

$\Delta \vec{p} = m \cdot \Delta \vec{v}$;

$m \cdot \Delta \vec{v} = \Delta t \cdot \Sigma \vec{F}$;

$\vec{p_{T1}} = \vec{p_{T2}}$

$m_1 \cdot v_1 = m_2 \cdot v_2$

$I = m \cdot \vec{v}$

200N → SOLO 5s;

MRU

$x = x_0 + v_0 \cdot t$;

$\vec{p} = \Delta t \cdot \Sigma F = 5 \cdot 200 = 1000\ N$

$1000 = 50 \cdot v$;

$v = 20$

~~1000 15 0~~

$x = 0 + 20 \cdot 5 = 100\ m$

(23)

ISN → 104

$v_0 = 0\ m/s \quad t = 0\ s$

$v_f = 30\ m/s \quad t = ?$

$p_{inicial} = p_{final}$

$10 \cdot 30 = \Delta t \cdot 15$;

$\Delta t = \frac{300}{15} = 20\ s$ //

(25) $m \cdot \vec{v} = \Delta t \cdot F$

$$\vec{F} = \frac{m \cdot \vec{v}}{t}$$

150 g = 0'1 kg

45 m/s

detenerlo en 0'3 s

$(\Delta \vec{t} = 0'3\ s$

$\Delta \vec{v} = -45\ m/s)$

$v_2 - v_1$

$0'15 \cdot (-45) = 0'3 \cdot F$;

$F = -22'5\ N$ //

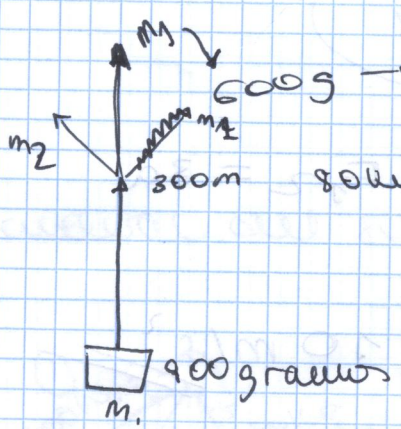
1 s

0'1 s décimas

0'01 centésimas

0'001 milésimas

(26) →



$\left(\vec{P}_{\text{inicial total}}\right) = \left(\vec{P}_{\text{final total}}\right)$;

$(m_1 + m_2) \cdot 22'22 = m_1 \cdot 27'77 + m_2 \cdot v_2$;

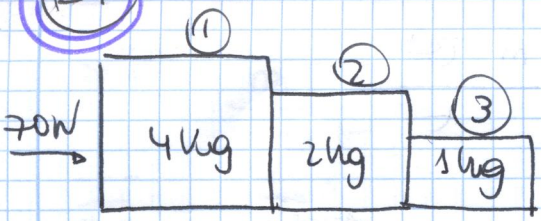
$0'900 \cdot 22'22 = 0'600 \cdot 27'77 + 0'300 \cdot v_2$;

$v_2 = 11'11\ m/s$ //

¿hacia donde va?

¿ángulo?

(27)



aceleración?

$\Sigma F = m_T \cdot a$

$\Sigma F = \frac{m \cdot v}{t}$

① $F - F_{12} = m_1 \cdot a$;

② $F_{12} - F_{23} = m_2 \cdot a$;

③ $F_{23} = m_3 \cdot a$

1) $70 - F_{12} = 4 \cdot a$

2) $F_{12} - F_{23} = 2 \cdot a$

3) $F_{23} = a$

2) $F_{12} - a = 2a$; $F_{12} = 3a$

1) $70 - 3a = 4a$;

$70 = 7a$; $a = 10\ m/s^2$

(28)

$T_{max} = 12000\ N$;

$P = 8829\ N$

a) máxima aceleración?

$\Sigma F = m \cdot a$;

$T - P = m \cdot a$;

$12000 - 8829 = 700\ a$;

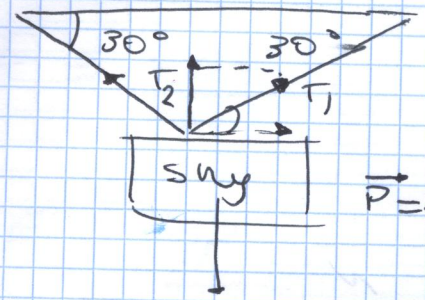
$a = 3'52\ m/s^2$

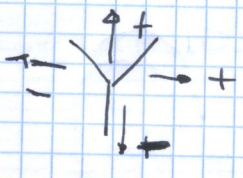
b) $\Sigma F = m \cdot a$

$T - 8829 = 700 \cdot 2'5$;

$T = 11079\ N$

(29) What? descomponer tensió en components?





$\vec{P} = -5g\vec{j}$

$\vec{T_1} = T\cdot \text{sen}\,30\vec{i} + T\cdot \cos 30\vec{j}$

$\vec{T_2} = -T\cdot \cos 30\vec{i} + T\cdot \text{sen}\,30\vec{j}$

$\vec{T_1}+\vec{T_2} = 2T\cdot \text{sen}\,30\vec{j}$;

$5g\vec{j} = 2T\,\text{sen}\,\vec{j}$;

$T = 5g$;

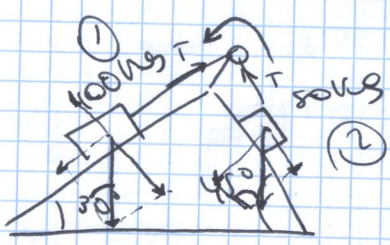
$\vec{\Sigma F} = (\vec{T_1}+\vec{T_2}) + \vec{P} = 0$,

$\vec{T_1} + \vec{T_2} = -\vec{P} = 5g\vec{j}$

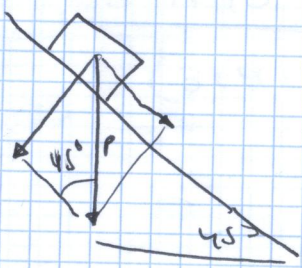
$\vec{T_1} = 5g\cdot\cos 30\vec{i} + 5g\cdot \text{sen}\,30\vec{j} =$
$= 42'48\vec{i} + 24'525\vec{j}$ //

$\vec{T_2} = -5g\cdot\cos 30\vec{i} + 5g\cdot \text{sen}\,30\vec{j} =$
$= -42'48\vec{i} + 24'525\vec{j}$ //

(30) acceler. del sistema. fàcil?



$\Sigma F = m\cdot a$



(1) $\Sigma F = m\cdot a$;

$P = 100\cdot 9'81 = 981\,N$

$P_x = 981\cdot \text{sen}\,30° = 490'5\,N$

$P_y = 981\cdot \cos 30° = 849'57\,N$

$P_x - T = 100\cdot a$

$490'5 - T = 100a$

(2) $P = 490'5$

$P_x = P\cdot \cos 45° = 346'84$

$T - P_x = 50a$;

$T - 346'84 = 50a$

$-T + 490'5 = 100a$

$T - 346'84 = 50a$

$143'66 = 150a$;

$\vec{F} = m \cdot \vec{a}$; ~~$m_1 \cdot v_1 = m_2 \cdot v_2$~~ $(p_{inicial\ total}) - (p_{final\ total})$

$\vec{F} = \frac{m \cdot \Delta \vec{v}}{\Delta t}$; $m_1 \cdot v_1 = m_2 \cdot v_2$

$\vec{F} = \frac{\Delta p}{\Delta t}$

ejemplos resueltos

(4) $m_T = 5'98 \cdot 10^{24}$ kg

$m_L = 7'35 \cdot 10^{22}$ kg

$d_{T-L} = 384000$ km $= 384 \cdot 10^6$ m

$F_T + F_L = 0$;

$F_T = F_L$;

$F = G \cdot \frac{m_T \cdot m_L}{d^2} = 6'67 \cdot 10^{-11} \cdot \frac{5'98 \cdot 10^{24} \cdot 7'35 \cdot 10^{22}}{(384 \cdot 10^6)^2} =$

$= 1'99 \cdot 10^{20}$ N

$F_T = F_L = G \cdot \frac{M_T}{d^2} = G \cdot \frac{m_L}{d^2}$;

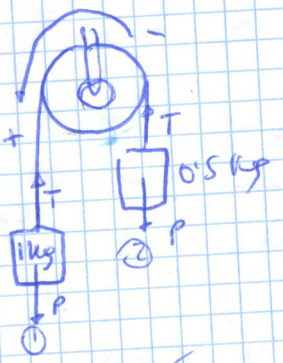
$G \cdot \frac{M_T}{d^2} = G \cdot \frac{m_L}{d^2}$

$d^2 \cdot G \cdot M_T = d^2 \cdot G \cdot m_L$

$d^2 \cdot 5'98 \cdot 10^{24} = d^2 \cdot 7'35 \cdot 10^{22}$;

$5'9065 \cdot 10^{24}$

(5) máquina de Antwood



aceleración sistema = ???

$\Sigma F = m \cdot a = \frac{m \cdot a}{t} =$

$= \frac{P}{t}$

$F_1 = P_1 - T = m \cdot a$

$F_2 \quad T - P_2 = m \cdot a$

$P_1 - P_2 = m a$

$9'81 - 4'905 =$

$P_1 - T = m \cdot a$

$T - P_2 = 0'5\, a$

$9'81 - 4'905 = 0'5\, a$

$a = \frac{4'905}{1'5} = 3'27 \ m/s^2$

$T = 0'5\, a + P_2$

$T = 0'5 \cdot 3'27$

$$g = G \cdot \frac{m_{Tierra}}{d^2}$$

(1) $g_{nivel\ mar} = G \cdot \frac{M}{6'370 \cdot 10^6}$

$$P = m \cdot g = G \frac{mM}{d^2}$$

$9'81 = g$ nivel mar ; ¿masa Tierra?

$$9'81 = 6'67 \cdot 10^{-11} \cdot \frac{M}{(6'370 \cdot 10^6)^2}$$

$$M = 9'37 \cdot 10^{17}\ kg$$

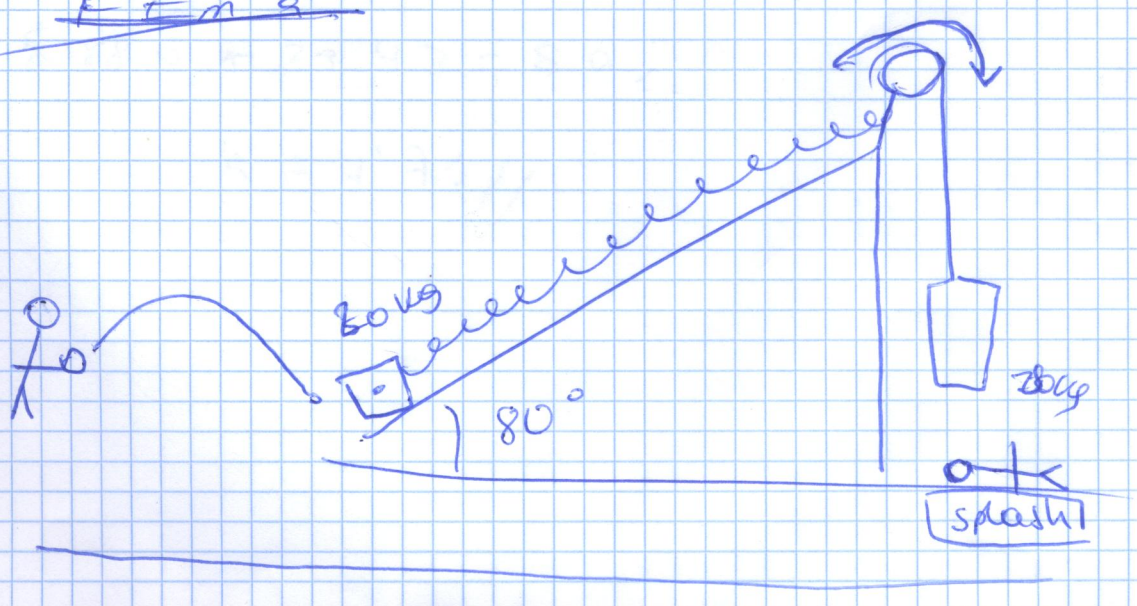
persona al nivel del mar: $981 - 70 = 686'7\ N$

$$P = m \cdot g = G \cdot \frac{M - m}{d^2}$$

$$g = 6'67 \cdot 10^{-11} \cdot \frac{9'37 \cdot 10^{17}}{6'370 \cdot 10^6} = 9'8117$$

=

$E_T = m \cdot g$



Ficha

$F = k \cdot x$

$x = (l_f - l_i)$

$l_i = 40$

$k = 50 N/m =$

$= 0'05 N/cm$

$10 N$

$x = \frac{F}{k} = \frac{10N}{50N/m}$

$x = 0,2 m = 20 cm.$

ecuación

$l_i = 40 cm \rightarrow l_f = 60 cm$

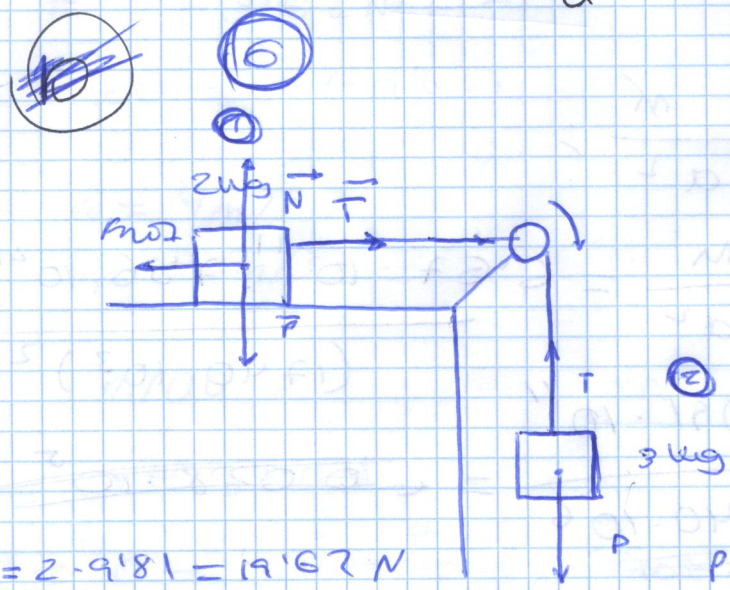
$x = l_f - l_i$

$20 = l_f - 40$

$l_f = 60 cm !!$

$$P = m \cdot g = G \cdot \frac{M \cdot m}{d^2}$$

$$g = G \cdot \frac{M}{d^2}$$



1)

$P_1 = 2 \cdot 9'81 = 19'62\ N$ $\quad P_2 = 3 \cdot 9'81 = 29'43$

$N = 19'62\ N$

$Froz = N \cdot \mu = 19'62 \cdot 0'3 = 5'886$

1) ~~If Fro~~

$$\left.\begin{aligned} T - Froz &= 2a \\ P_2 - T &= 3a \end{aligned}\right\}$$

$$-Froz + P_2 = 5a$$

$$-5'886 + 29'43 = 5a$$

$$a = 4'71\ //$$

(1) $g_{LUNA} = ?$

$M_L = 7'36 \cdot 10^{22}$ kg

$R_L = 1740$ km $= 1740 \cdot 10^3$ m;

$F = m \cdot g$;

$F = G \cdot \frac{M \cdot m}{d^2}$;

$g = G \cdot \frac{M}{d^2} = \frac{6'67 \cdot 10^{-11} \cdot 7'36 \cdot 10^{22}}{(1740 \cdot 10^3)^2} =$

$= \frac{49'091 \cdot 10^{11}}{1740 \cdot 10^6} = 0'028 \cdot 10^5$

$= 1'62 \cdot$ ~~10~~ m/s^2 //

(6) 2 electrones → fuerzas repulsivas por tener la misma carga (negativa)

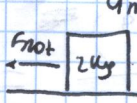
$F_S = G \cdot \frac{m_1 \cdot m_2}{d^2} = 6'67 \cdot 10^{-11} \cdot \frac{(9'1 \cdot 10^{-31})^2}{d^2} =$

$= \frac{5'52 \cdot 10^{-71}}{d^2}$

$F_E = 9 \cdot 10^9 \cdot \frac{(-1'6 \cdot 10^{-19})^2}{d^2} = \frac{2'304 \cdot 10^{-28}}{d^2}$

La eléctrica es mayor

(7)



aturar en 5s

$P = 2 \cdot 9'81 = 19'62\,N$;

$N = -19'62\,N = -P$;

$F_{rot} = \mu \cdot (-19'62)$

$v_0 = 4\,m/s$;

$v_f = 0\,m/s$

mrua;

$v = v_0 + a \cdot t$

$0 = 4 + a \cdot t$; ~~$F_{rot} \cdot 5 = -4$~~

negatiu perque

$-4 = 5a$; $a = -\frac{4}{5} = -0'8\,m/s^2$;

~~$-0'8 = \mu \cdot (-19'62)$;~~

~~$\mu = 0'04$~~

$F_{rot} = m \cdot a = 2 \cdot 0'8 = -1'6\,N$

(8)

$l_i = 40\,cm$

$K = 50\,N/m = 0'5\,N/cm$

$F = K \cdot x$;

$x = \frac{F}{K} = \frac{10}{0'5} = 0'2\,m$

$10 = 0'05 \cdot (l_f - 40)$;

$10 = l_f\,0'05 - 2$;

$l_f = \frac{5}{0'05} = 100\,cm$

$l_f - l_i = 0'2$

$l_f - 0'40 = 0'2$;

$50\,\frac{N}{m} \cdot \frac{1\,m}{100\,cm}$ $l_f = 0'6\,m$

(22) p+ y e^- → atracción

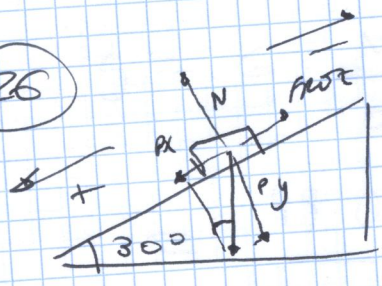
$F = K \cdot \frac{q_1 \cdot q_2}{d^2} = 9 \cdot 10^9 \cdot \frac{(1'602 \cdot 10^{-19})^2}{(5^{-11})^2} =$

$= 9'2 \cdot 10^{-8}$ N ← repulsiva

$0'5 \text{ Å} \cdot \frac{10^{-10} \text{ m}}{1 \text{ Å}} =$

$= 5^{-11}$

(26)



$m = 10 kg \quad \mu = 0'2$

$P = m \cdot g = 98'1 N$

$P_x = 98'1 \cdot \text{sen } 30° = 49'05 N$

$P_y = 98'1 \cdot \cos 30° = 84'96 N =$

$= N;$

$a = ?$

$F_{roz} = \mu \cdot N = 0'2 \cdot 84'96 =$

$= 16'99 N$

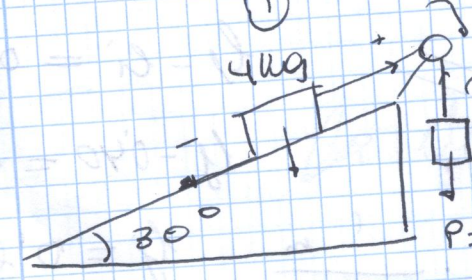
$\Sigma F = m \cdot a;$

$P_x - F_{roz} = m \cdot a;$

$49'05 - 16'99 = 10 \cdot a;$

$a = 3'21 \text{ m/s}^2$

(27) $\mu = ??$ Está en equilibrio



$\Sigma F_1 = \Sigma F_2;$

① $P = 39'24 N$

$P_x = P \cdot \text{sen } 30 \simeq 19'62 N$

$P_y = 33'98 N = N$

$P = 19'62 N$

① $\Sigma F = T - F_{roz} - P_x = 4a$

② $\Sigma F = P - T = 4a$

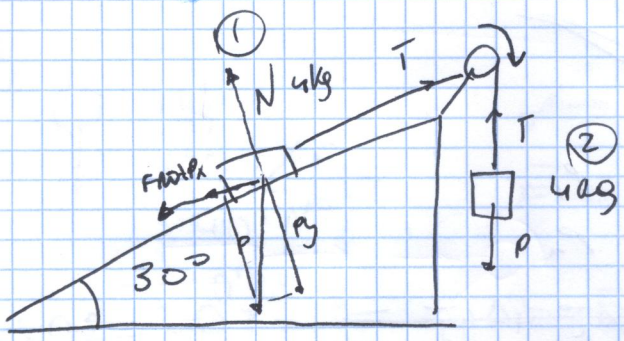
$-F_{roz} - P_x + P = 8a$

$-F_{roz} - 19'62 + 19'62 = 8a$

$a = 0$

30

$T - F_{roz} - P_x = P - T$



Filem eq. $\Sigma F_1 = \Sigma F_2$

$\mu = ?$

① $P = 39'24\ N$

$P_x = 39'24 \cdot \sin 30 = 19'62$

$P_y = 33'98\ N = N$

② $P = 39'24\ N$

① $T - P_x - F_{roz} = m \cdot a$

② $P - T = m \cdot a$

Si $T - P_x - F_{roz} = P - T$;

$T - 19'62 - F_{roz} = 39'24 - T$

$2T - 58'86 - F_{roz} = 0$;

$F_{roz} = 137'34 = \mu \cdot N$;

$\mu \cdot 33'98 = 137'34$; $\mu = -4'4$ What

Impuls

$\vec{p} = m \cdot \vec{v}$

$\vec{F} = m \cdot a = \frac{m \cdot \vec{v}}{t} = \frac{\vec{p}}{t}$

(1)

$30 N s = 2 \cdot \vec{v}$

$v = 15 \, m/s$

(2) $30\vec{i} - 40\vec{j}$ p_1

$-30\vec{i} - 20\vec{j}$ p_2

$30\vec{i} - 40\vec{j} + x\vec{i} + y\vec{j} = -30\vec{i} - 20\vec{j}$

$\Delta p = F \cdot t$

$(-30\vec{i} - 20\vec{j}) - (30\vec{i} - 40\vec{j}) = F \cdot 4$

$-60\vec{i} + 20\vec{j} = F \cdot 4$

$F = -15\vec{i} + 5\vec{j}$

(3) $505 = 0{,}05 \, kg$

$5 m/s$

$0{,}25$

$-5 m/s$

$|F| = \left| \frac{m \Delta v}{\Delta t} \right| = \left| \frac{0{,}05 \cdot (-8)}{0{,}2} \right| = |-2N| = 2N$

$\Sigma F = m \cdot a$

$\vec{p} = m \cdot \vec{v}$

$\vec{F} \cdot t = m \cdot \vec{v}$

(4)

$\vec{F} = \frac{m \cdot \Delta \vec{v}}{\Delta t}$;

$\Delta t \cdot \vec{F} = m \Delta \vec{v}$;

$\vec{v} = \frac{0'05 \cdot 40}{1}$;

$\Delta \vec{v} = 2$;

$v_2 - v_1 = 2$;

$v_2 - (-1'5) = 2$;

$v_2 = 0'5 m/s$

(5) $p = 5\vec{i} + 20\vec{j}$

$\Delta F = \frac{\Delta p}{t}$

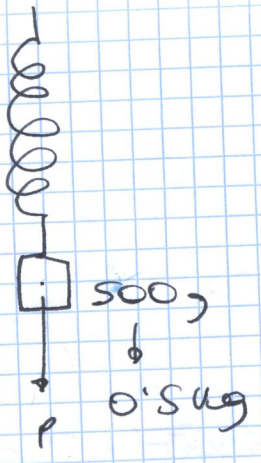
$-10\vec{i} + 5\vec{j} = \frac{p_F - (5\vec{i} + 20\vec{j})}{3}$;

$-30\vec{i} + 15\vec{j} = p_F - (5\vec{i} + 20\vec{j})$;

$p_F = (-30\vec{i} + 15\vec{j}) + (5\vec{i} + 20\vec{j}) =$

$= -25\vec{i} + 35\vec{j}$ //

(32)



$x = 5cm = 0'05m$

$K = ?$

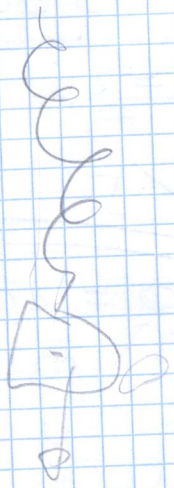
$F = x \cdot -k$;

$F = P \cdot g = 4'9N$;

$4'9N = 0'05 \cdot -k$;

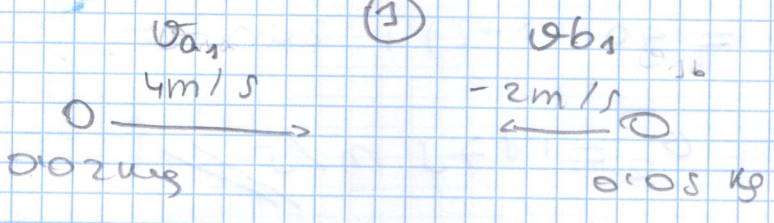
$K = -98N/m$

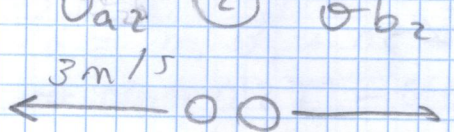
es negativo porque repone al muelle: trata de devolver el muelle a su estado natural l_0.



conservación momento lineal

20 g 0'02 kg
80 g 0'05 kg





$$\left(\vec{P}_{\text{inicial total}}\right) = \left(\vec{P}_{\text{final total}}\right)$$

$$m_a \cdot v_{a_1} + m_{b_1} \cdot v_{b_1} = m \cdot v_{a_2} + m \cdot v_{b_2}$$

$$0'02 \cdot 4 + 0'05 \cdot (-2) = 0'02 \cdot (-3) + 0'05 \cdot v_{b_2}$$

$$-0'02 = -0'06 + 0'05\, v_{b_2}$$

$$\frac{0'04}{0'05} = v_{b_2} = 0'8 \text{ m/s} //$$

① 

$$\vec{P} = m \cdot \vec{v}$$

$$P_{\text{inic.}} = 15 \cdot 30$$

$$P_{\text{final}} = 1200 \cdot v_2$$

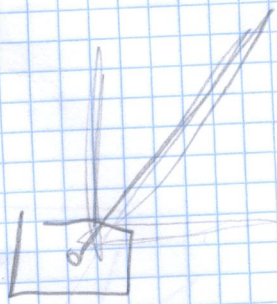
$$v_2 = 0'375 //$$

(2)

$p_i = p_f$

$310 \cdot 1 = 70 \cdot (-2) + 240 \cdot v_2$

$v_2 = 1'875 \text{ m/s}$



(3)

300g → 0'03 kg

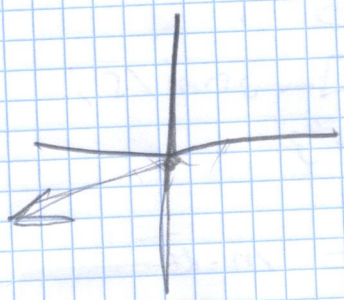
100 m/s 2kg

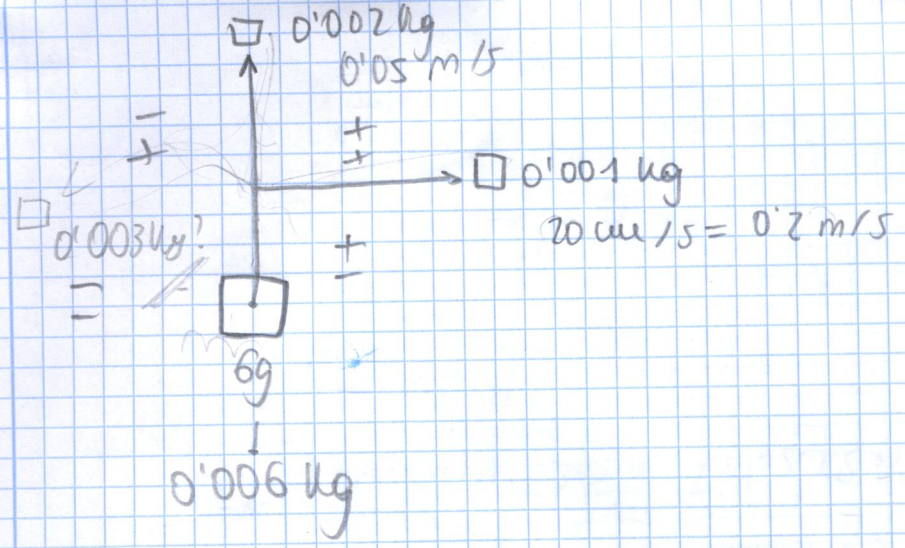
$(\overrightarrow{p_{inicial\ total}}) = (\overrightarrow{p_{final\ total}})$

$0'03 \cdot 100 = 2'003 \cdot v_2$

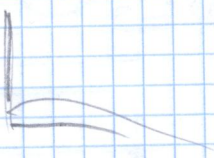
$1'5 \text{ m/s}$

(4)





$\frac{cm}{s} \cdot \frac{1\,m}{100\,cm}$



$(\vec{P}\ \text{inicial}) \equiv (\vec{P}\ \text{final})$

$m_0 \cdot \vec{v}_0 = m_1 \cdot \vec{v}_1 + m_2 \cdot \vec{v}_2 + m_3 \cdot \vec{v}_3$

$0'006 \cdot 0 = 0'001 \cdot 0'2\,\vec{i} + 0'002 \cdot 0'05\,\vec{j} + 0'003 \cdot \vec{v}_3$

$0 = 2 \cdot 10^{-4}\,\vec{i} - 1 \cdot 10^{-4}\,\vec{j} + 0'003 \cdot \vec{v}_3$

$\vec{v}_3 = \frac{-2 \cdot 10^{-4}\,\vec{i} - 1 \cdot 10^{-4}\,\vec{j}}{0'003}$

$\vec{v}_3 = -0'0666\,\vec{i} - 0'0333\,\vec{j}$

$|\vec{v}_3| = \sqrt{(0'066)^2 + (0'033)^2} = \sqrt{5'55 \cdot 10^{-3}} =$

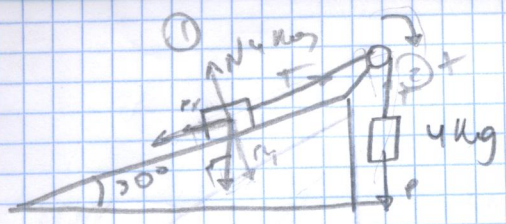
$= 0'074\ m/s = 7'4\ cm/s$ //

ángulo:

$\alpha_{v_3} = \operatorname{arctg} \frac{0'0333}{0'0666} = 26°\,33'\,54''$

en 3er cdte por ángulo:

$206°\,33'\,54''$ //



$\Sigma F_1 = \Sigma F_2$

$\mu = ?$

① $P = 49'05\ N$

② $P = 49'05$

$P_x = 49'05 \cdot \sin 30 = 24'525\ N$

$P_y = 49'05 \cdot \cos 30 = 42'48\ N$

$\downarrow \quad T - P = 0 \qquad T = P_2$

$\Sigma F = P - T = 0$

① $\Sigma F = T - P_x - F_{roz} = 0;$

$T - 24'525 - F_{roz} = 0;$

$T = 24'525 + F_{roz}$

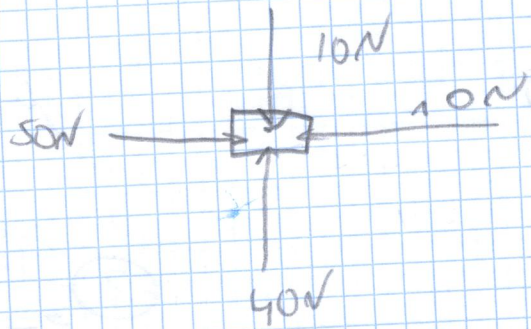
②

$\Sigma F = P - T = P - (24'525 + F_{roz}) = 0$

$49'05 - 24'525 - F_{roz} = 0;$

$F_{roz} = 24'525\ N = \mu \cdot 42'48;$

$$\mu = \frac{24'525}{42'48} = 0'57\ N \cdot s$$



$$\Sigma F = (50 - 10) + (40 - 10) =$$

$$\Sigma F = 0 ;$$

$$F + 50 - 10 + 40 - 10 = 0 ;$$

$$F$$

$$F = m \cdot g = G \cdot \frac{m \cdot M}{d^2}$$

$$F = K \cdot \frac{q_1 \cdot q_2}{d^2}$$

$$100 N = 6{,}67 \cdot 10^{-11} \cdot \frac{10^{10} \cdot 10^{15}}{d^2} ;$$

(demasiado)

$20N \rightarrow \ell_f \quad 25cm = 0'25m$

$30N \rightarrow \ell_f \quad 30cm = 0'30m$

$F = x \cdot k$

$20 = k \cdot (\ell - \ell_0)$

$20 = k \cdot (0'25 - \ell_0)$ }

$30 = k \cdot (0'3 - \ell_0)$ }

~~$\ell_0 + 0'25k = \ell_0 k$~~

~~$20 = k \quad (\ell -$~~

$20 = k \cdot (0'25 - \ell_0)$ }

$30 = k \cdot (0'3 - \ell_0)$ }

$k = \frac{20}{0'25 - \ell_0}$;

k

$30 = \frac{6 - 20\ell_0}{0'25 - \ell_0}$;

$7'5 - 30\ell_0 = 6 - 20\ell_0$;

$1'5 = 10\ell_0$;

$\ell_0 = 0'15\,m = 15cm$

20
0'3
6 0
0 0

0'25
30
7'5

$$F = m \cdot a = \frac{m \cdot \Delta \vec{v}}{\Delta t} = \frac{\Delta \vec{p}}{\Delta t};$$

$$I = F \cdot \Delta t \quad N \cdot s$$

(27)

a sistema?

$$\Sigma F = m \cdot a;$$

$$\left.\begin{array}{l} 1\{\Sigma F_1 = 70N - F_{12} = m_1 \cdot a \\ 2\{\Sigma F_2 = F_{12} - F_{23} = m_2 \cdot a \\ 3\{\Sigma F_3 = F_{23} = m_3 \cdot a \end{array}\right\}$$

2) $\Sigma F_2 = F_{12} - (m_3 a) = m_2 a$;

$F_{12} - a = 2a$;

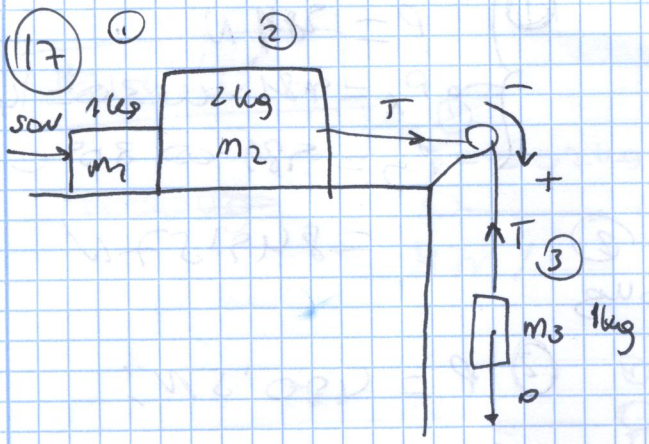
$F_{12} = 3a$;

1) $70N - 3a = 4a$;

$70N = 7a$;

$a = 10 \, m/s^2$ //

(17)



plano inclinado
dos poleas
campo, gravitatorio
campo eléctrico
muelle

cuerpo 1 y 2

1) $SON - F_{12} = m \cdot a$

2) $T - F_{12} = m \cdot a$

3) $9'81 - T = m \cdot a$

$SON - F_{12} = a$

$T - F_{12} = 2a$

$9'81 - T = a$

$-T = a - 9'81$;

$T = 9'81 - a$

$SON - F_{12} = 9'81 - T$

$SON - F_{12} = 9'81 - 2a - F_{12}$

$SO - 9'81 = a$;

2

$a =$

$T - F_{12} = 2a$;

$9'81 - a - F_{12} = 2a$;

$-F_{12} = 2a + a - 9'81$;

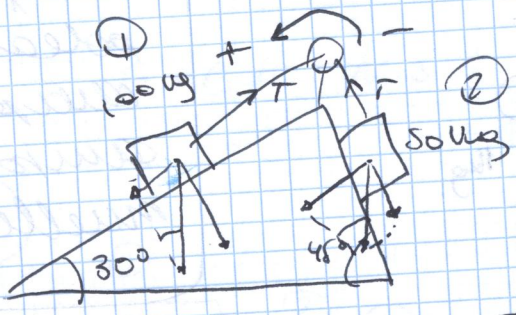
$F_{12} = 3a - 9'81$;

$SO - 3a + 9'81 = a$;

$59'81 = 4a$;

$a = 14'9525 \ m/s^2$

① $\begin{cases} P = 981\ N \\ P_x = 981 \cdot \sin 30 = 490'5\ N \\ P_y = 981 \cdot \cos 30 = \\ \quad = 849'57\ N \end{cases}$

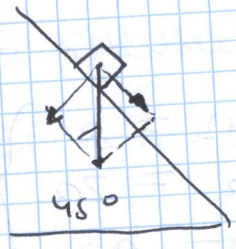


② $P = 490'5\ N$;

$\rightarrow P_x = 490'5 \cdot \cos 45 = 346'8\ N$

$P_y = 490'5 \cdot \sin 45 = 346'8\ N$

Al tener mayor P_x el cuerpo 1, irá hacia la izquierda



$\Sigma F = m \cdot a$

$\Sigma F_1 = P_x - T = m \cdot a$;

$490'5 - T = 100a$;

$\Sigma F_2 = T - P_x = m \cdot a$;

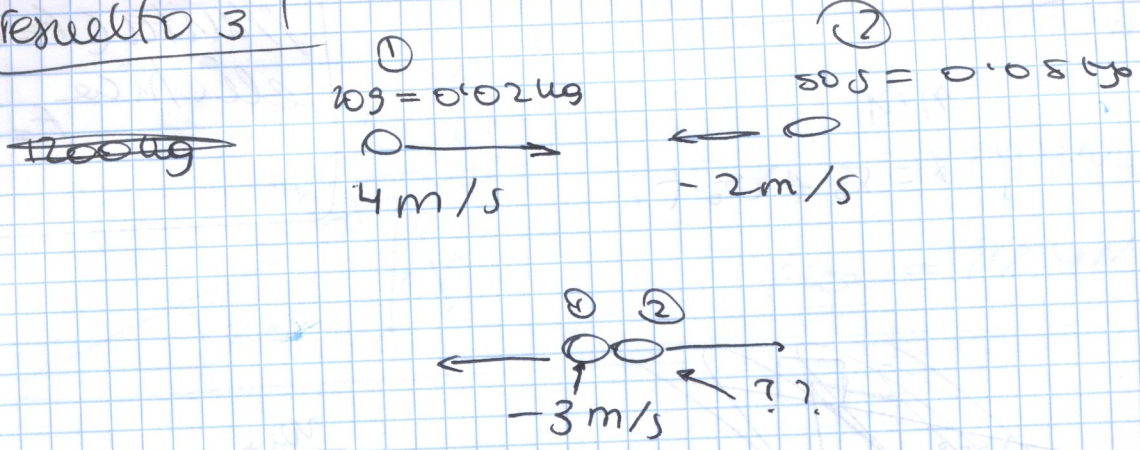
$T - 346'8 = 50a$

$$\left.\begin{array}{l} -T + 490'5 = 100a \\ T - 346'8 = 50a \end{array}\right\}$$

$$143'66 = 150a$$

$$a = 0'96\ m/s^2$$

Resuelto 3



$$\left(\vec{P}_{\text{total inicial}}\right) = \left(\vec{P}_{\text{total final}}\right) \qquad \vec{p} = m \cdot \vec{v}$$

$$m_1 \cdot v_1 + m_2 \cdot v_2 = m_1 \cdot v_1' + m_2 \cdot v_2'$$

$$0'02 \cdot 4 + 0'05 \cdot (-2) = 0'02 \cdot (-3) + 0'05 \cdot v_2'$$

$$-0'02 = -0'06 + 0'05\, v_2'$$

$$\frac{0'04}{0'05} = v_2' = 0'8 \text{ m/s} //$$